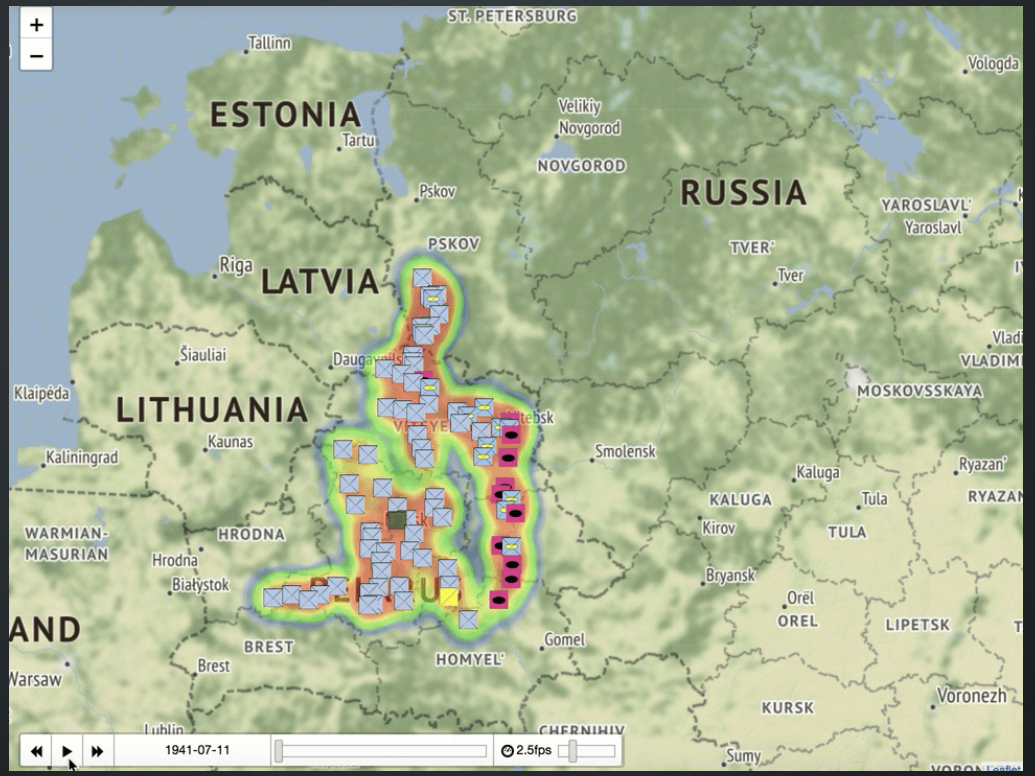

OPMAPS OPERATIONAL MILITARY ANALYTICS AND PRESENTATION – DATA AND NARRATIVES IN MILITARY HISTORY AND BEYOND

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POST-DOCTORAL RESEARCHER, COLLEGE OF LIBERAL ARTS, RETIRED US ARMY LTCOL (R), ARMOR BRANCH

WHO IS OPMAPS?

Ideamonger

Sorin Adam Matei

- Social scientist historian with social mapping expertise
- History degree
- Creator of multiple interdisciplinary initiatives

Historian

Robert Kirchubel

- Retired US LtCol – Armored Forces
- Author of Eastern Front and Blitzkrieg Atlases (WWII)
- Dissertation “German Generals and Political Engineering”

Software Developer

Rajesh Kalyana

Student Interns

Zhan Gao

Sadiq Albinalshaikh

WHAT IS OPMAPS?

- Bring operational military mapping into the 21st century, exploit current, massive computing and graphics power.
- Overcome limitations of traditional static maps.
- Trust the data, know where it comes from.
- Supporting data is quarriable and searchable.
- Works on any operation for which detailed data exists, does not need to be combat.
- Proof-of-concept pilot project examines WWII Battle of Smolensk, 10 July-10 September 1941.

HOW AND WHY IS OPMAPS NEW?

Uses digital humanities data to support historical scholarship and advance our knowledge from **representational to inferential**.

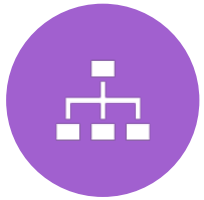
Collaboration between experts in history, communication technology, and social sciences.

New historical **method of collecting, visualizing, and interpreting** operational military history.

Create a **mapping database** and visualization tools.

Use **spatial-temporal statistical** techniques.

YOU CAN BRING DATA BACK TO THE SPATIAL DECISION AND INTERPRETATION SPACE.



YOU FLATTEN THE ANALYTIC PROCESS: DATA, CODE, AND MAPS ARE TRANSPARENT AND OPEN

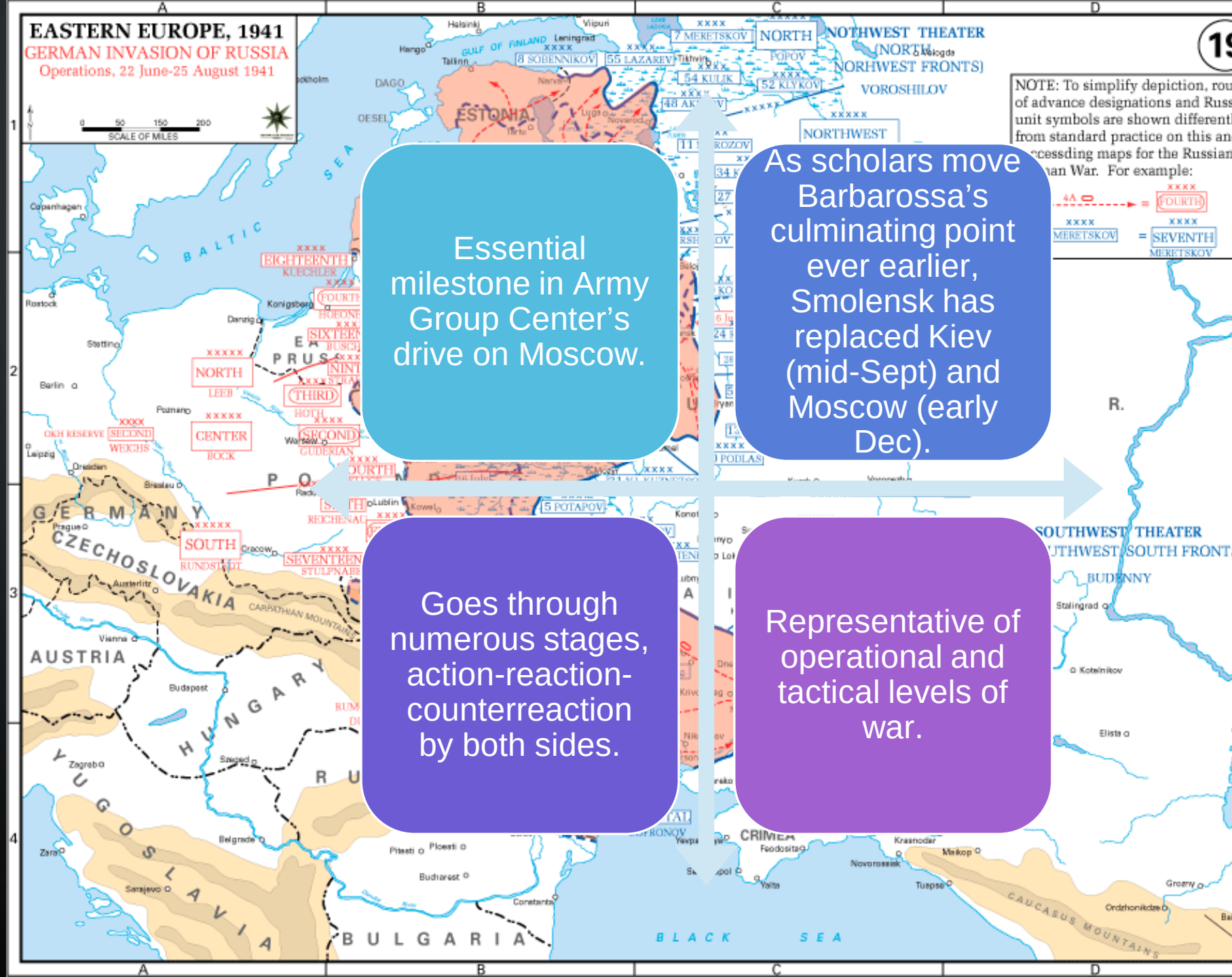
YOU CAN OVERCOME THE TEMPTATION TO VISUALIZE AT THE EXPENSE OF ANALYSIS.

YOU CAN CREATE MAPS THAT CAN GENERATE MORE MAPS AND NEW INTERPRETIVE MAPS

YOU CAN CHECK EXISTING NARRATIVES AGAINST PAST DATA

YOU CAN USE NEW WAYS TO ANALYZE DYNAMIC OPEARTIONAL ENVIRONMENTS

THE BATTLE OF SMOLENSK, 10 JULY-10 SEPT 1941



Essential milestone in Army Group Center's drive on Moscow.

As scholars move Barbarossa's culminating point ever earlier, Smolensk has replaced Kiev (mid-Sept) and Moscow (early Dec).

Goes through numerous stages, action-reaction-counterreaction by both sides.

Representative of operational and tactical levels of war.

MAP MAKING WORKFLOW

Primary data – original staff / command maps – OKW – "Hitler's Maps"

Digitize at division level:

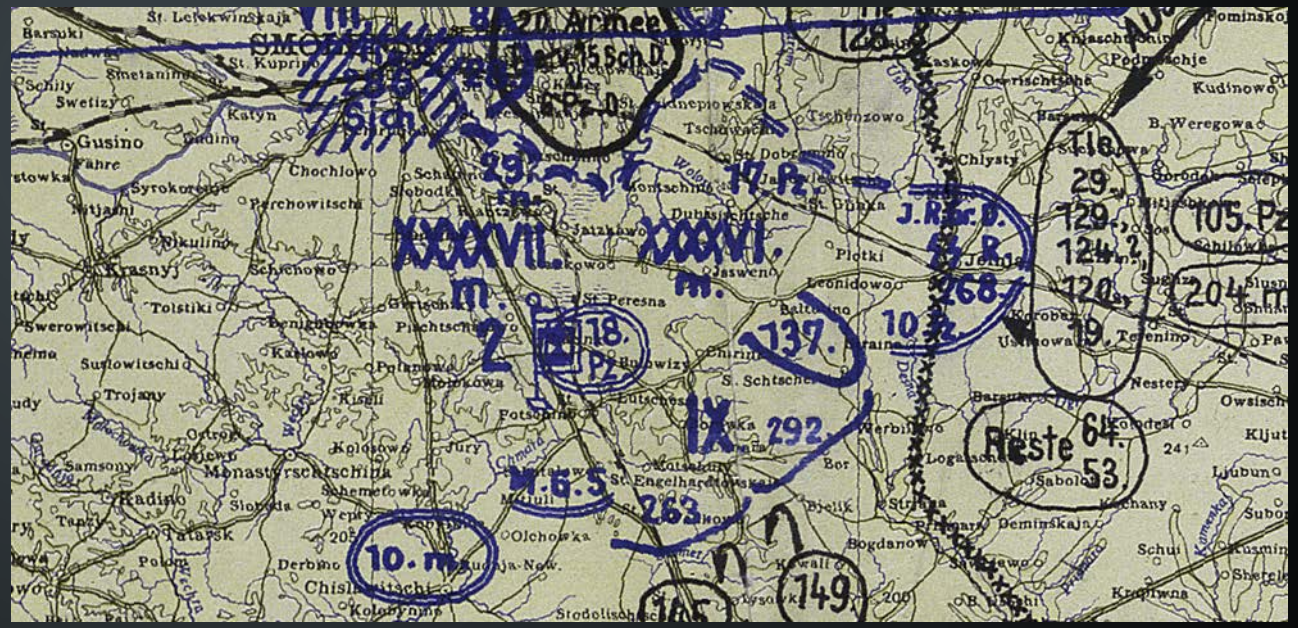
- Location
- Frontage shape
- Direction of movement
- Fractional presence

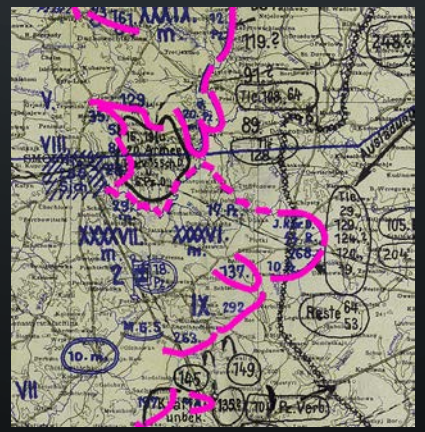
Move raw digital data (time-space coordinates) to open source map (OWS)

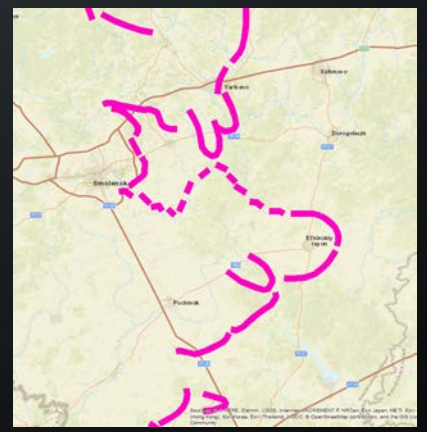
Create fully visible, open source code to animate and analyze the movement of the troops

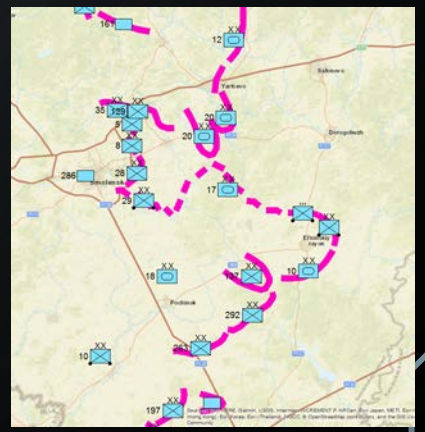
HOW WE CREATE A MAP ANALYTIC ENVIRONMENT

- Start with primary source or hyper-reliable secondary sources.
  - Military High Command (OKW) twice daily situation maps – One every other day
  - Manual drawing with quality control.
  - Geocoded on top of original maps
- Add front lines
- Determine central point of front line, place unit symbol









OPMAPS ARE FIRST OF ALL DATASETS.

- Geography grad student and programming post-doc created and refined divisional database with Rob as quality control:

Unit: 7 Pz Div

Activity: Moving, Stationary

Date

Strength

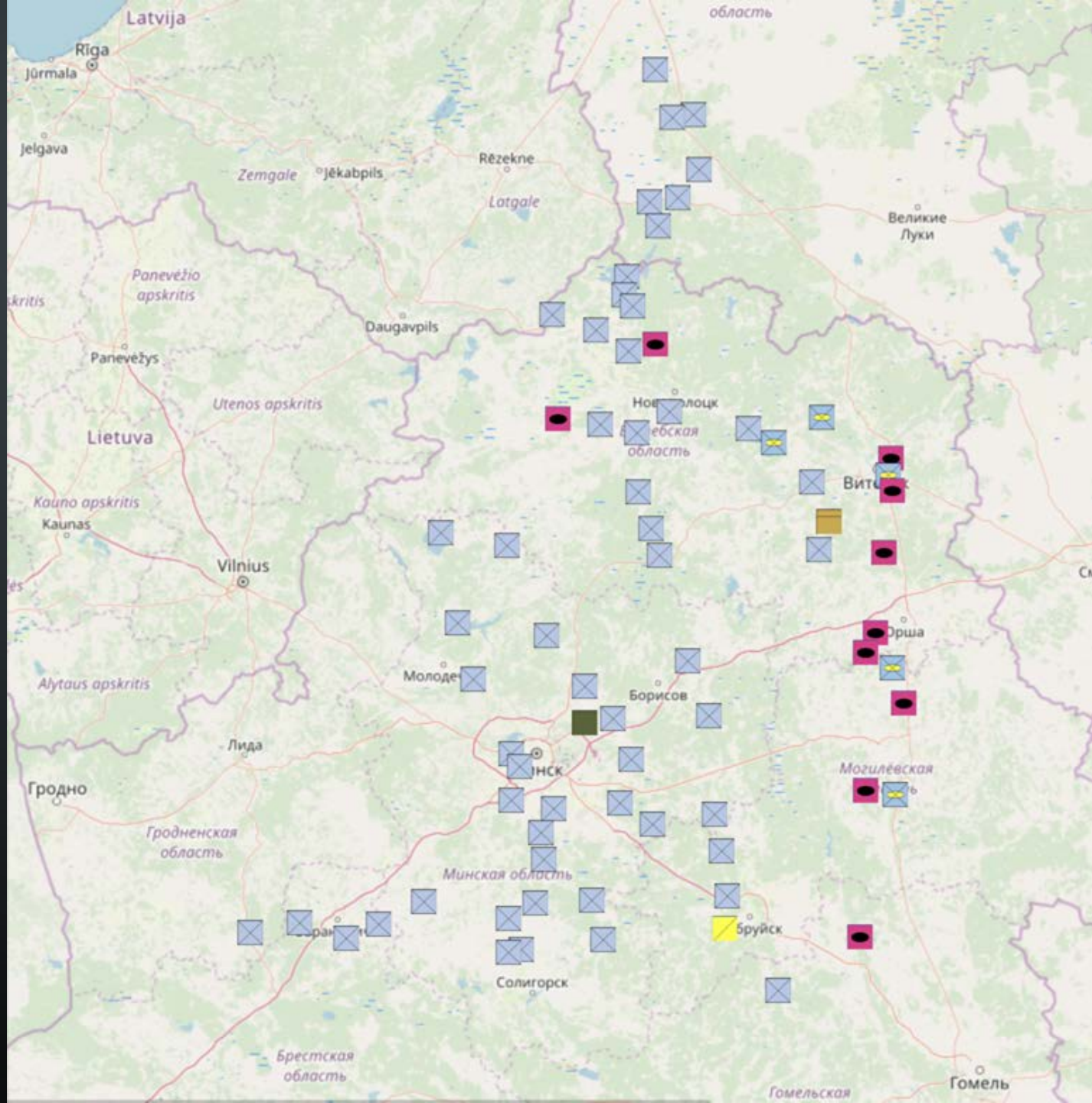
Type of unit

Division or non-divisional

Lat-Long

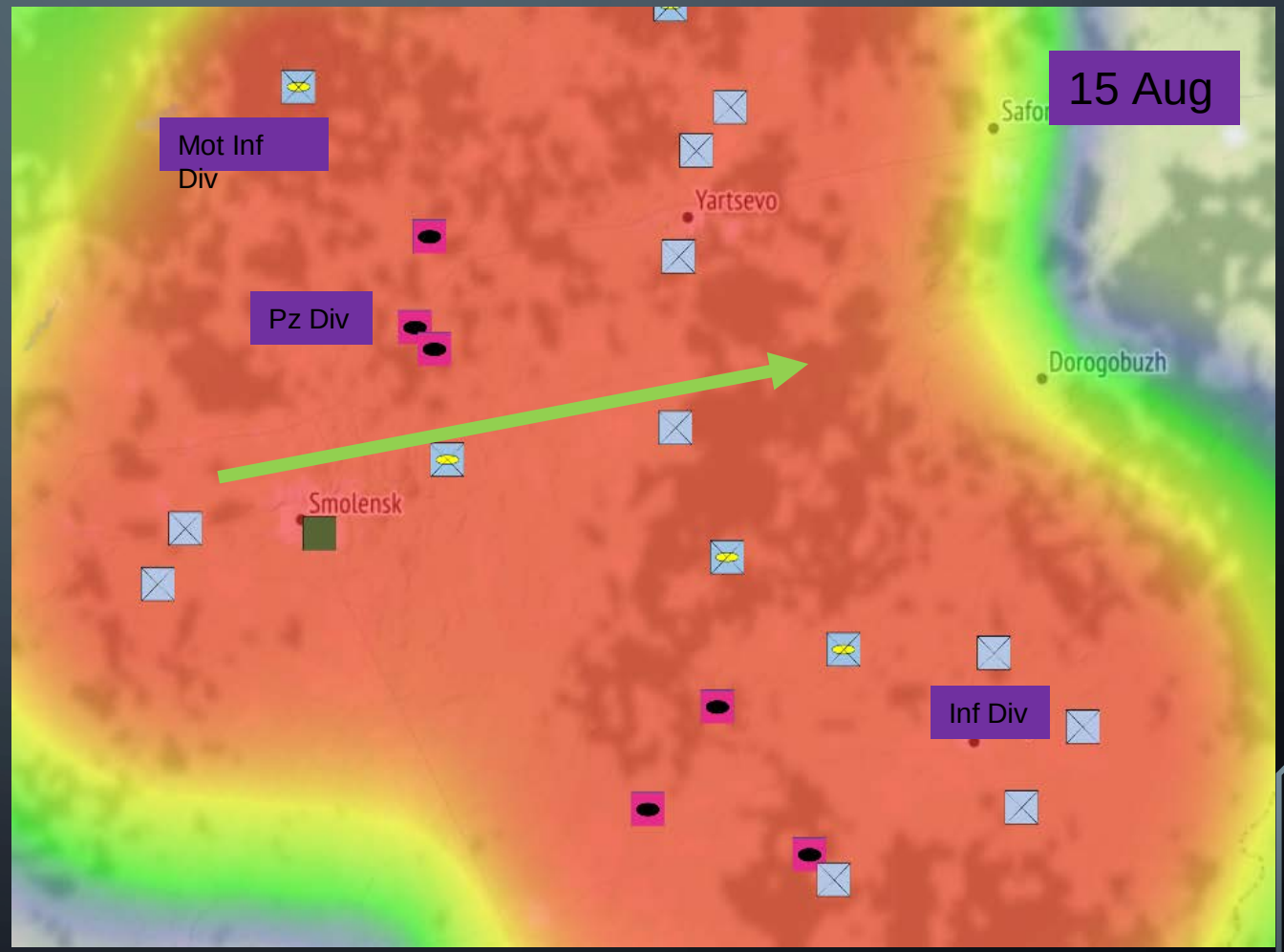
PzDiv	7	7/12/1941		PZR	4	Mass		1		374	30.48568	55.13449
PzDiv	7	7/12/1941		PZR		1	FWD DET	0		377	30.60465	55.22907
PzDiv	7	7/13/1941		PZR	5			1		151	31.49029	55.28639
PzDiv	7	7/15/1941 0:00	1	PZR	5			1		269	32.35553	55.14081
PzDiv	7	7/16/1941 0:00	1	PZR	5			1		390	32.44066	55.13056
PzDiv	7	7/17/1941 0:00	1	PZR	5			1		102	32.43949	55.10432
PzDiv	7	7/19/1941 0:00	1	PZR	5			1		440	32.40599	55.141
PzDiv	7	7/ 0:00	1	PZR				1		385	32.58839	55.16361
PzDiv	7	7/ 0:00	1	PZR				1		84	32.59198	55.10485
PzDiv	7	7/26/1941 0:00	1	PZR	5			1		421	32.67501	55.0005
PzDiv	7	7/27/1941 0:00	1	PZR	5			1		193	32.71613	54.93937
PzDiv	7	7/29/1941 0:00	1	PZR	5			1		437	32.65384	54.98698
PzDiv	7	7/30/1941 0:00	1	PZR	5			1		292	32.70381	55.06233
PzDiv	7	8/1/1941 0:00	1	PZR		1	FWD DET	1		124	32.40008	53.89385
PzDiv	7	8/2/1941 0:00	1	PZR	5			1		352	3	9935

MAP DATA MOVED TO OPEN SOURCE MAP (OSW). PUBLISHING AND EDITING ONLINE WITH NO SPECIALIZED SOFTWARE

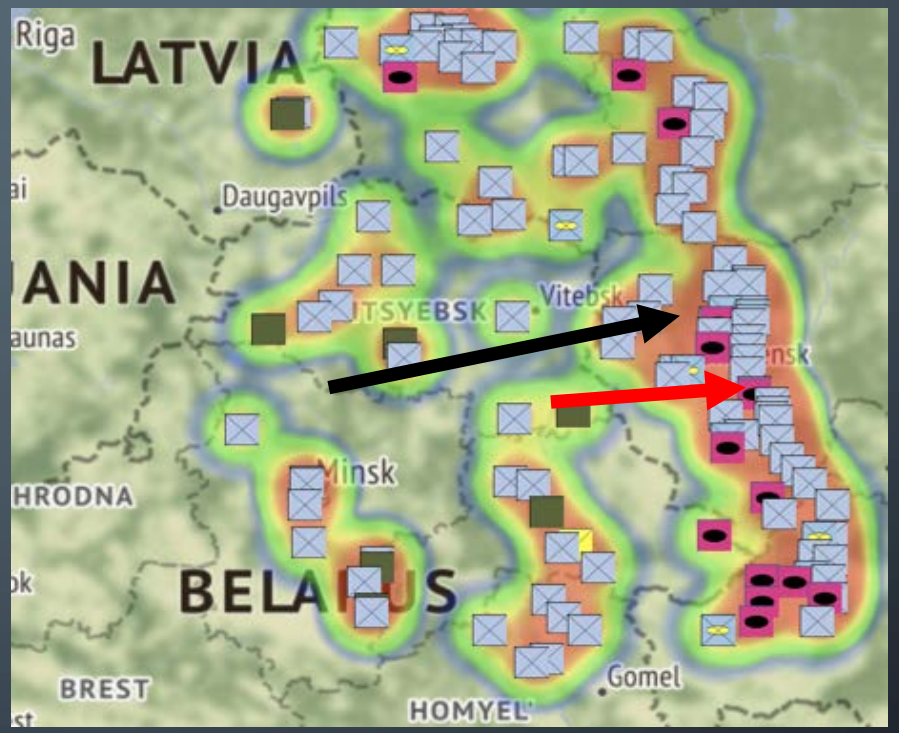


ADDING DEPTH AND DETAILS

- Assign “strength” variable (PZ > INF)
- Calculate “massed fire envelope”
  - Heatmap
  - Colors increase in intensity as troops become denser
- Calculate average movement vector = “effective reach”



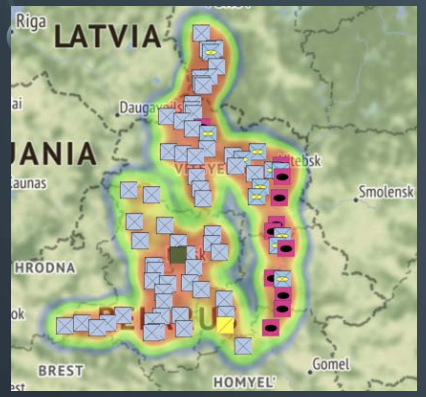
AVERAGE VECTORS OF ATTACK



Vector of attack:

- A calculated measure that indicates the average “penetration distance and direction” for a unit or for group(s) of units
- It measures the ”effective reach” of each unit or group of units
- It “tucks in” or expands the exposed edges of an advance, indicating how far the bulk of the forces really got.

THE BATTLE – BLOW BY BLOW



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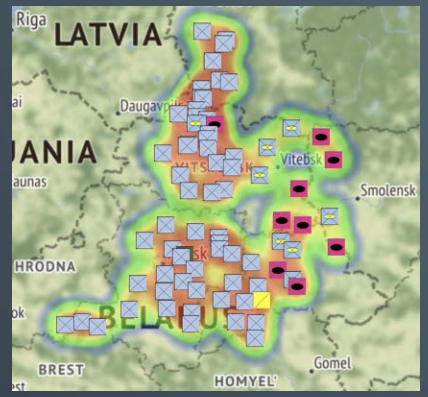

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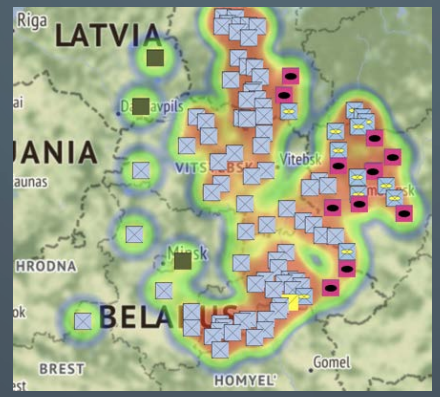

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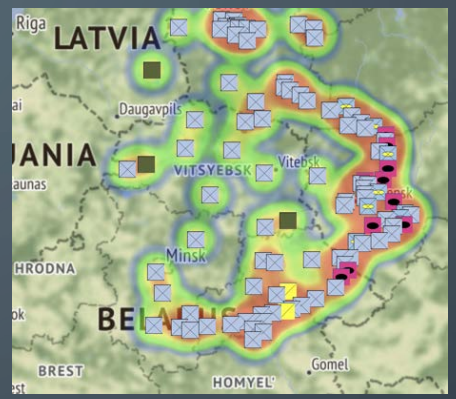

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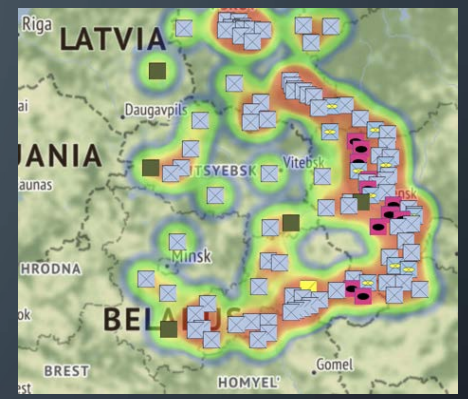
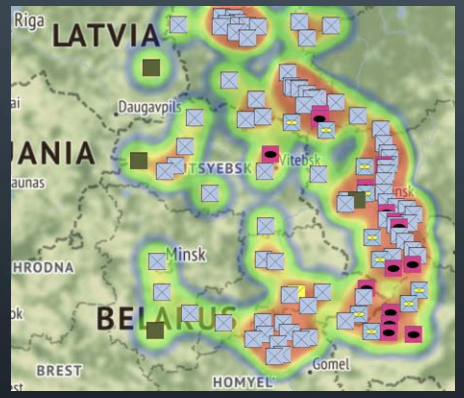


August 11



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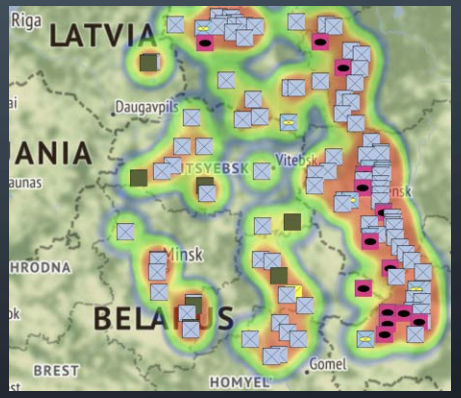
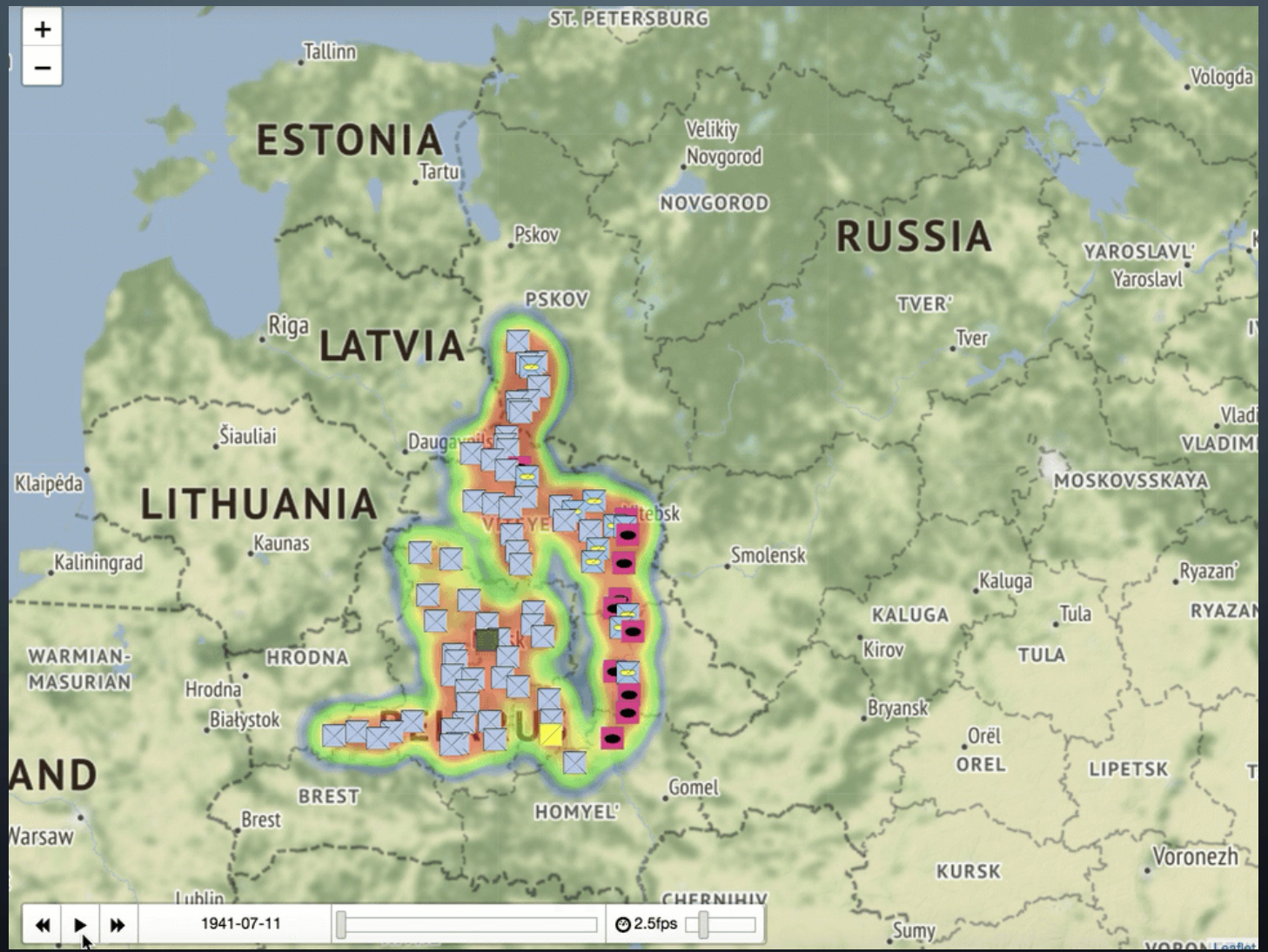


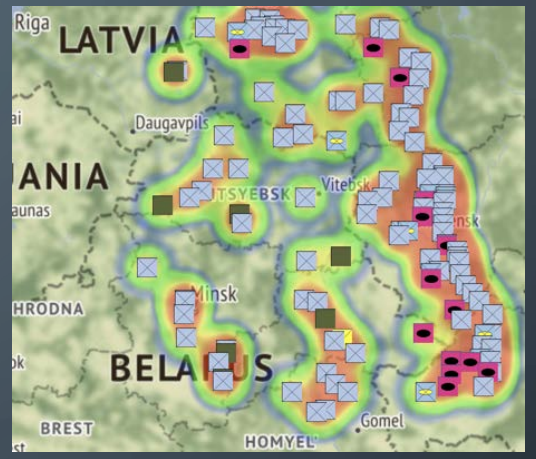
September 09

THE BATTLE UNFOLDS



INTERACTIVE MAPS

- Battle Animation
  - Overall and unit level movement tracker with nominal fire envelope
  - OPMAPS Animation page
- Vector calculator
  - OPMAPS vector calculator page



SHORT TERM FUTURE PLANS

Add corps and army level analysis

Analyze operational level

Add Soviet data – all levels of analysis

Collaboration with Russian / Soviet military experts (US or abroad)

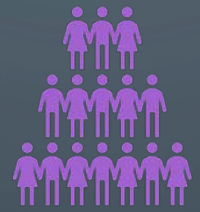
Adding strength data – move from abstract / nominal to concrete data

MEDIUM TO LONG TERM FUTURE PLANS

Calculate fire envelope by

Lethality potential

- standardized effective destruction firepower
- average weapon range
- Mobility



Calculate “Schwerpunkt potential” at given locations

ratio of combatants’ local strength

ratio of movement momentum

Simulation scenarios

Changing direction of movement

Changing fire envelope parameters

Interdicting directions of movement

QUESTIONS AND DISCUSSION…